

इंटरनेट

मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 4027-5 (1987): Methods of chemical analysis of bronzes, Part 5: Determination of tin-iodimetric method [MTD 8: Copper and Copper Alloys]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE



IS : 4027 (Part 5) - 1987

Indian Standard

METHODS OF CHEMICAL ANALYSIS OF BRONZES

PART 5 DETERMINATION OF TIN-IODIMETRIC METHOD

(First Revision)

First Reprint JUNE 1989

UDC 669.35'6:543.242.3[546.811]

© Copyright 1988

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

*Indian Standard*METHODS OF
CHEMICAL ANALYSIS OF BRONZES

PART 5 DETERMINATION OF TIN-IODIMETRIC METHOD

*(First Revision)*Methods of Chemical Analysis of Non-Ferrous Metals Sectional
Committee, SMDC 34*Chairman*

DR CH VENKATESWARLU

Members

SHRI J. BANERJEE

Representing

Bhabha Atomic Research Centre, Bombay

SHRI A. C. MALICK (*Alternate*)

CHEMIST & METALLURGIST

NORTHERN RAILWAY, LUCKNOW

ASSISTANT RESEARCH OFFICER

(MET)-2 RDSO LUCKNOW (*Alternate*)

SHRI D. P. JAIN

SHRI R. D. RASTOGI (*Alternate*)

SHRI A. M. KAMADE

SHRI B. P. MAHAPATRA

Steel Authority of India Ltd (Durgapur Steel
Plant), Durgapur

Ministry of Railways

Saru Smelting Pvt Ltd, Meerut

Kamani Metals and Alloys, Bombay

Directorate General of Ordnance Factories,
CalcuttaSHRI R. N. ROY (*Alternate*)

SHRI D. D. MISHRA

SHRI K. C. MODI (*Alternate*)

SHRI R. N. MISHRA

DR L. P. PANDEY

SHRI K. K. GUPTA (*Alternate*)

DR D. C. PARASHER

SHRI J. RAI (*Alternate*)Hindustan Aluminium Corporation Ltd,
Mirzapur

Hindustan Copper Ltd, Khetri Nagar

National Metallurgical Laboratory (CSIR),
JamshedpurNational Physical Laboratory (CSIR),
Jamshedpur*(Continued on page 2)*

© Copyright 1988

BUREAU OF INDIAN STANDARDS

This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

(Continued from page 1)

<i>Members</i>	<i>Representing</i>
SHRI B. R. RAI	Cominco Binani Zinc Ltd, Binanipuram
SHRI M. SRINIVASAN (<i>Alternate</i>)	
SHRI M. RAE	National Test House, Calcutta
SHRI A. K. DUTTA GUPTA (<i>Alternate</i>)	
DR J. RAJARAM	Essen & Co, Bangalore
SHRI K. S. SUNDARA KRISHNAN (<i>Alternate</i>)	
DR G. PREM KUMAR	Hindustan Zinc Ltd, Udaipur
SHRI B. L. GUPTA (<i>Alternate</i>)	
SHRI A. K. ROY	Bharat Aluminium Company Ltd, Korba (Madhya Pradesh)
SHRI K. P. MUKHERJEE (<i>Alternate</i>)	
SHRI R. K. SAWANT	Indian Standard Metal Co Ltd, Bombay
SHRI N. R. MANIAR (<i>Alternate</i>)	
DR P. D. SHARMA	Hindustan Copper Ltd, Ghatshila
SHRI D. C. MATHUR (<i>Alternate</i>)	
SHRI J. R. SIL	Ministry of Finance (India Govt Mint), Bombay
SHRI R. P. SINGHAL	Indian Smelting and Refining Company Ltd, Bombay
SHRI A. N. DOSHI (<i>Alternate</i>)	
SHRI B. MUKHERJI, Director (Struc & Met)	Director General, BIS (<i>Ex-officio Member</i>)

Secretary

SHRI M. L. SHARMA
Assistant Director (Metals), BIS

Indian Standard

METHODS OF CHEMICAL ANALYSIS OF BRONZES

PART 5 DETERMINATION OF TIN-IODIMETRIC METHOD

(First Revision)

0. FOREWORD

0.1 This Indian Standard (Part 5) (First Revision) was adopted by the Bureau of Indian Standards on 22 July 1987, after the draft finalized by the Methods of Chemical Analysis of Non-Ferrous Metals Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 IS : 4027 first published in 1967, covered determination of copper, lead, tin, manganese, phosphorus, nickel, iron silicon, aluminium, zinc and antimony in bronzes. While reviewing this standard, the Sectional Committee decided that it is convenient to revise this standard in series of parts, which, on publication will supersede the relevant method for determination given in 'IS : 4027-1967*'. This part is one of that series and covers the determination of tin by iodimetric method. The other parts are as follows:

Part 1 Determination of copper and lead by electrolytic method

Part 2 Determination of manganese by photometric method

Part 3 Determination of phosphorus by volumetric method

Part 4 Determination of nickel by photometric method

Part 6 Determination of zinc by complexometric (EDTA) method

Methods for chemical analysis of other constituents in bronzes, namely, aluminium, iron, silicon and antimony are under preparation and will be published in subsequent parts of above series.

0.3 In this revision, the figure for determination of tin, incorporated in earlier edition, has been deleted and method has been updated.

0.4 The method of analysis prescribed in this standard may primarily serve as referee method and may also be used by the laboratories for

*Methods of chemical analysis of bronzes.

their day-to-day work. Due consideration has been given in the preparation of this standard to the facilities available in the country for such analysis.

0.5 In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated; is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard (Part 5) prescribes a method for determination of tin in ranges as specified in the relevant Indian Standards on bronzes.

NOTE — This method is not applicable for aluminium bronze and aluminium silicon bronze where tin is 0.20 percent or more.

2. SAMPLING

2.1 Samples shall be drawn and prepared in accordance with IS : 1817-1961†.

3. QUALITY OF REAGENTS

3.1 Unless specified otherwise, analytical grade reagents and distilled water (see IS : 1070-1977‡) shall be employed in the test.

4. GENERAL

4.1 Use of Filter Paper — In the method prescribed in this standard, relative numbers of Whatman filter papers, which are commonly used, have been specified. However, any other suitable brand of filter papers of corresponding porosity may also be used.

5. DETERMINATION OF TIN BY THE IODIMETRIC METHOD

5.1 Outline of the Method — Tin is separated by precipitation with ammonium hydroxide in presence of iron. After reduction, it is determined iodometrically.

5.2 Reagents

5.2.1 Concentrated Hydrochloric Acid — r.d. = 1.16 (conforming to IS : 265-1976§).

*Rules for rounding off numerical values (revised).

†Methods of sampling non-ferrous metals for chemical analysis.

‡Specification of water for general laboratory use (second revision).

§Specification for hydrochloric acid (second revision).

5.2.2 Dilute Nitric Acid — 1 : 1 (v/v).

5.2.3 Ferric Chloride Solution — Dissolve 25 g of ferric chloride crystals ($\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$) in 400 ml of water containing a few drops of concentrated hydrochloric acid and dilute to a litre.

5.2.4 Concentrated Ammonium Hydroxide — 20 percent.

5.2.5 Ammonium Chloride Solution — 20 g/l (w/v).

5.2.6 Antimony Chloride Solution — Dissolve 20 g of antimony chloride (SbCl_3) in 500 ml of concentrated hydrochloric acid and dilute to one litre with water.

5.2.7 Iron — Iron of purity not less than 99.85 percent in the form of wire or strip.

5.2.8 Potassium Iodide Solution — Dissolve 100 g of potassium iodide in water and dilute to one litre.

5.2.9 Starch Solution — Make a suspension of 1 g of soluble starch in about 5 ml of water and add it carefully to 100 ml of boiling water. Cool the solution before use. Prepare fresh.

5.2.10 Standard Potassium Iodate Solution (0.05 N) — Twice recrystallize potassium iodate from water and dry at 180°C to constant weight. Dissolve 1.7835 g in 200 ml of water containing 1 g of sodium hydroxide and add 10 g of potassium iodide. When dissolution is complete, make up to one litre. Standardize the solution against pure standard tin solution following the procedure described under 5.3.2.

5.2.11 Standard Tin Solution — Dissolve 0.5 g of tin in 300 ml of dilute hydrochloric acid (1 : 1) in 400 ml beaker by warming gently until the metal has dissolved. If the dissolution is difficult, add 0.05 to 0.1 g of potassium chlorate. Cool and make up to one litre.

5.3 Procedure

5.3.1 Transfer 1.000 g of sample into a 250-ml beaker. In case tin content is 0.1 percent or less, 10 g of sample should be taken. Add 5 ml of concentrated hydrochloric acid and 20 ml of dilute nitric acid, adding more concentrated hydrochloric acid, if necessary, to keep the tin in solution. When the solution is complete, add 10 ml of ferric chloride solution and boil for 2 minutes. Dilute to 400 ml with water and add concentrated ammonium hydroxide solution until the precipitated copper hydroxide is dissolved and the smell of ammonia persists. Heat to boiling and allow to settle for one hour. Filter through Whatman No. 40 filter paper and wash with hot ammonium chloride solution. Dissolve the precipitate with hot concentrated hydrochloric acid. Reprecipitate with concentrated ammonium hydroxide, boil, filter and

wash thoroughly with hot ammonium chloride solution. Remove the paper and precipitate from the funnel and place in a 500 ml Erlenmeyer flask. Add 200 ml of water and 75 ml of concentrated hydrochloric acid.

5.3.2 Add two drops of antimony chloride solution and 5 g of iron and swirl the flask to break up the paper and to aid in the solution of the precipitate. Stopper the flask with a rubber bung having two holes one for air condenser and the other for burette. Heat the solution to boiling, and boil with continuous evolution of gas for at least 45 minutes (see Note).

NOTE — Some undissolved iron should remain in the flask at the end of reduction.

After reduction is complete, cool the contents of the flask to about 10°C maintaining an atmosphere of carbon dioxide by passing carbon dioxide gas into the flask. Add 5 ml of potassium iodide solution and 5 ml of starch solution and titrate with the standard potassium iodate solution to persistent blue colour.

5.3.2.1 Carry out a blank determination following the same procedure and using the same quantities of all the reagents but without the sample.

5.4 Calculation

$$\text{Tin, percent} = \frac{(A - B) \times C}{D \times 10}$$

where

A = volume in ml of the standard potassium iodate solution required for the test solution,

B = volume in ml of standard potassium iodate solution required for the blank,

C = tin equivalent of the standard potassium iodate solution in mg/ml, and

D = mass in g of the sample taken.

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones: 331 01 31, 331 13 75

Telegrams: Manaksanstha
(Common to all Offices)

Regional Offices:

Telephone

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002 { 331 01 31
331 13 75

*Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola, CALCUTTA 700054 { 36 24 99

Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036 { 2 18 43
3 16 41

Southern : C. I. T. Campus, MADRAS 600113 { 41 24 42
41 25 19
41 29 16

†Western : Manakalaya, E9 MIDC, Marol, Andheri (East), BOMBAY 400093 { 6 32 92 95

Branch Offices:

'Pushpak', Nurmohamed Shaikh Marg, Khanpur, AHMADABAD 380001 { 2 63 48
2 63 49

‡Peenya Industrial Area 1st Stage, Bangalore Tumkur Road BANGALORE 560058 { 38 49 55
38 49 56

Gangotri Complex, 5th Floor, Bhadbhada Road, T. T. Nagar, BHOPAL 462003 { 6 67 16

Plot No. 82/83, Lewis Road, BHUBANESHWAR 751002 { 5 36 27
53/5, Ward No. 29, R.G. Barua Road, 5th Byelane, GUWAHATI 781003 { 3 31 77

5-8-56C L. N. Gupta Marg (Nampally Station Road), HYDERABAD 500001 { 23 10 83

R14 Yudhister Marg, C Scheme, JAIPUR 302005 { 6 34 71
6 98 32

117/418 B Sarvodaya Nagar, KANPUR 208005 { 21 68 76
21 82 92

Patliputra Industrial Estate, PATNA 800013 { 6 23 05
T.C. No. 14/1421, University P.O., Palayam TRIVANDRUM 695035 { 6 21 04
6 21 17

Inspection Offices (With Sale Point):

Pushpanjali, First Floor, 205-A West High Court Road, Shankar Nagar Square, NAGPUR 440010 { 2 51 71

Institution of Engineers (India) Building, 1332 Shivaji Nagar, PUNE 411005 { 5 24 35

*Sales Office in Calcutta is at 5 Chowringhee Approach, P. O. Princep Street, Calcutta 700072 { 27 68 00

†Sales Office in Bombay is at Novelty Chambers, Grant Road, Bombay 400007 { 89 65 28

‡Sales Office in Bangalore is at Unity Building, Narasimharaja Square, Bangalore 560002 { 22 36 71